

ACRES AFFECTED AND LOSSES CAUSED BY
SAND PINE ROOT DISEASE, 1983

Forest Insect and Disease Information System (FIDIS)
Levels I and II

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ABSTRACT

Sand pine root disease, caused by a complex of root pathogens, infects 467,800 acres in four southeastern states, with nearly 98 percent occurring in Florida. Over 12.5 million trees are killed by the disease each year, representing 4.1 million cubic feet. Most losses occur in federally-owned, natural stands.

INTRODUCTION

In order to provide current information concerning losses to forest pests in the United States, the USDA Forest Service instituted the FIDIS. Two levels are recognized. Level I requires the reporting of acreage affected by the subject pest according to ownership and state in the region of its occurrence. Level II requires the reporting of the number and volume of trees killed and growth lost.

This paper presents FIDIS Levels I and II for sand pine root disease.

Sand pine, *Pinus clausa* (Chapm.) Vasey, is native to the sandhills of Florida and isolated strips of the Gulf Coast region, from the Florida panhandle, west to Alabama. Sites are characterized by deep, droughty sands low in organic matter and fertility. Two varieties occur within the natural range. Ocala sand pine (OSP) is native to the peninsula of Florida, while Choctawhatchee sand pine (CSP) is native to the panhandle and the upper Gulf Coast.

Because other commercial forest trees grow poorly or not at all on sand pine sites, the tree (chiefly CSP) has been promoted for regenerating unproductive sandhill sites in Florida, Georgia, and South Carolina. Approximately 2 million acres of these sites are found in Florida alone.

Recent surveys (Barnard et al., 1980; Oak and Barnard, 1983) have reported a root disease of sand pine involving as many as seven fungus pathogens. The principal pathogens are *Phytophthora cinnamomi* Rands in young plantations and *Inonotus circinatus* (Fries) Gilbertson in older stands. Other associated root disease organisms are *Verticicladiella procera*, *Heterobasidion annosum*, *Macrophomina phaseolina*, *Phaeolus schweinitzii*, and *Armillariella tabescens*. Infected trees have sparse root systems, feeder root mortality, intense resin soaking of woody roots, resin soaking in the root collar and butt section of the stem, windthrow, chlorotic foliage, thin crowns, and mortality. Sand pines of both races, all ages, and all stand types are affected. Damage is most severe in older, natural stands, but significant losses can occur in young plantations.

METHODS

In 1979-80 and 1981, surveys of the sand pine resource in Florida and Georgia-South Carolina, respectively, were conducted. Information on tree disease status, symptoms, associated disease-causing agents, and losses were collected.

Assumptions used in developing acres affected and loss tables:

1. The survey years are representative of annual conditions.
2. Annual mortality is represented by dead, brown- or red-topped trees.
3. Tree volumes are based on dbh only and are standard for southern pines (USDA, 1975).
4. Trees less than 4 inches dbh have no volume.
5. Sand pine acres in Florida are reported in Bechtold and Knight (1981) and further detailed by the Florida Division of Forestry.
6. Incidence of SPRD varies for the two survey areas (85% of acres infected in Florida; 72% in Georgia-South Carolina). Determined from actual surveyed area in the two areas; [sum of area of infected survey plots ÷ sum of area of all survey plots]).
7. Annual mortality rates (number and volume of trees) vary for different ownership/state combinations.

<u>Annual Mortality a/</u>		<u>Ownership</u>
<u># trees/ac</u>	<u>vol trees/ac (ft)</u>	
43.09	11.91	Ocala National Forest b/
6.11	3.03	Other Public Owners-Florida c/
12.92	5.72	All Private Owners-Florida d/
1.2	.07	Georgia-South Carolina e/

a/ All are corrected annual mortality rates determined from survey data (Barnard, et al., 1980; Oak, et al., 1981; Oak and Barnard, 1983).

b/ Natural stands of OSP.

c/ Mostly Eglin Air Force Base (CSP).

d/ Both races.

e/ Plantations of CSP.

Growth loss in diseased sand pine stands (part of FIDIS Level II) could greatly exceed the volume lost to mortality. However, growth rates of healthy and diseased sand pines of different age, race, and stand types are unavailable. A method for estimating growth loss is presented in an appendix, but is not included here.

RESULTS AND DISCUSSION

Table 1 presents the acreage of sand pine from Bechtold and Knight (1982) as detailed by the Florida Division of Forestry. Survey data were applied to the acreage to complete acres infected (Table 2) and mortality losses (Table 3)

Table 1.--Acreage (M) of sand pine by ownership and state, 1980.

State	OWNERSHIP				Total
	National Forest	Other Public	Industrial	Other Private	
Florida	202.9	80.9	71.6	181.9	537.3
Georgia	-	-	15.3	*	15.3
S. Carolina	-	-	*	-	*
Alabama	-	*	-	*	*
Total	202.9	80.9	86.9	181.9	552.6

- = No acreage present in state/owner category.

* = Very small acreage in state/owner category.

Table 2.--FIDIS I - Acres infected (M) by SPRD according to ownership and stand, 1983.

State	OWNERSHIP				Total
	National Forest	Other Public	Industrial	Other Private	
Florida	172.5	68.8	60.9	154.6	456.8
Georgia	-	-	11.0	*	11.0
S. Carolina	-	-	*	-	*
Alabama	-	*	-	*	*
Total	172.5	68.8	71.9	154.6	467.8

- = No acreage present in state/owner category.

* = Very small acreage in state/owner category.

Table 3.--FIDIS II - Number (MM) and volume (MM cubic feet) of trees killed by SPRD according to ownership and state, 1983.

State	OWNERSHIP									
	National Forest		Other Public		Industrial		Other Private		Total	
	#	vol	#	vol	#	vol	#	vol	#	vol
Florida	8.743	2.417	.494	.245	.925	.410	2.350	1.041	12.512	4.113
Georgia	-	-	-	-	.018	.001	*	*	.018	.001
S. Carolina	-	-	-	-	*	*	-	-	*	*
Alabama	-	-	*	*	-	-	*	*	*	*
Total	8.743	2.417	.494	.245	.943	.411	2.350	1.041	12.530	4.114

- = No acreage present in state/owner category.

* = Very small acreage in state/owner category.

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APPENDIX

Growth loss was not determined by survey, and reports of growth in undiseased sand pine stands are extremely limited or unavailable for most race/stand type/age categories. The following represents a rationale used for estimating growth loss rates and computing growth loss.

a. Disease incidence and loss accelerate with age. Annual volume increment lost to SPRD is assumed to occur at the following rates for different aged stands.

0-20 years	-	Zero loss
20-35 years	-	10%
>35 years	-	20%

b. Plantations in all areas are less than 20 years old and, therefore, have no growth loss associated with SPRD. Since only plantations occur outside of Florida, there is no growth loss in SPRD in this extended range.

c. Growth rates for the oldest plantations (Table I) have been estimated between 60 and 97 ft³/ac/yr. The only estimated rate for natural stands is 80 ft³/ac/yr, but specifics are not reported. Using published plantation growth rates, healthy natural stands are assumed to have average annual increments between 50 and 75 ft³/acre.

d. Ninety percent of the Florida sand pine acres in other public and other private ownerships are assumed to be natural stands, while 20 percent of the acres in Florida industrial ownerships are assumed to be natural.

e. The distribution of acres by age class is known for the Ocala Natural Forest (natural and seeded stands) and is proportionally applied to total natural stand acreage on other ownerships.

Growth loss was estimated on the basis of assumptions a-e. Computations are shown in Table II, and results are summarized in Table III. This growth loss rationale begins with published reports of sand pine growth rates, but is based on undocumented assumptions.

Table I.--Summary listing of average annual volume increments from stand establishments reported in sand pine literature.

Annual Volume Increment (ft ³ /ac/yr)	Parameters				
	Race	Stand Type	Measurement Period (Age)	Location	Author
86	CSP	Planted	0-15	GA-SC	Hebb (1982)
71	OSP	Planted	0-15	GA-SC	
97	CSP	Planted	0-35	FL	Burns (1978)
66	CSP	Planted	0-16	FL	Burns
80	CSP	Planted	0-20	FL	and
46	OSP	Planted	0-16	FL	Brendemuhl
54	OSP	Planted	0-20	FL	(1978)
54-81 <u>1/</u>	CSP	Planted	0-20	FL	Burns (1973)
59-80 <u>1/</u>	CSP	Planted	0-25	FL	
61-83 <u>1/</u>	CSP	Planted	0-30	FL	
60-84 <u>1/</u>	CSP	Planted	0-35	FL	
28	CSP	Planted	0-7	FL	Brendemuhl
24	OSP	Planted	0-7	FL	(1973)
80 <u>2/</u>	CSP	Natural	0-40	FL	Britt (1973)

1/ Projected growth.

2/ Estimated growth of 1 cord/ac/yr (80 ft³/cord) for well stocked, good sites.

Table II.--Computations of annual growth loss to SPRD, exclusive of mortality.

Ownership Age Class	Natural Stand Acres	Infected ^{5/} Acres	Annual Increment (ft ³ /ac)		Loss (ft ³ /ac)
National Forest	^{2/}		⁵⁰	⁷⁵	
20-35 ^{1/}	31,363	26,659	1,332,950	1,999,425	133,295 - 199,943 ^{6/}
>35	89,869	76,389	3,819,450	5,729,175	763,890 - 1,145,835 ^{7/}
Total	<u>121,232</u>	<u>103,048</u>	<u>5,152,400</u>	<u>7,728,600</u>	<u>897,185</u> - <u>1,345,778</u>
Other Public	^{3/}				
20-35 ^{1/}	18,836	16,011	800,550	1,200,825	80,055 - 120,083 ^{6/}
>35	53,974	45,878	2,293,900	3,440,850	458,780 - 688,170 ^{7/}
Total	<u>72,810</u>	<u>61,889</u>	<u>3,094,450</u>	<u>4,641,675</u>	<u>538,835</u> - <u>808,253</u>
Industrial	^{4/}				
20-35 ^{1/}	941	800	40,000	60,000	4,000 - 6,000 ^{6/}
>35	2,697	2,292	114,600	171,900	22,920 - 34,380 ^{7/}
	<u>3,638</u>	<u>3,092</u>	<u>154,600</u>	<u>231,900</u>	<u>26,920</u> - <u>40,380</u>
Other Private	^{3/}				
20-35 ^{1/}	42,352	35,999	1,799,950	2,699,925	179,995 - 269,993 ^{6/}
>35	121,358	103,154	5,157,700	7,736,550	1,031,540 - 1,547,310 ^{7/}
Total	<u>163,710</u>	<u>139,153</u>	<u>6,957,650</u>	<u>10,436,475</u>	<u>1,211,535</u> - <u>1,817,303</u>

^{1/} No growth loss below age 20; therefore, no loss in plantation since almost no plantations are over age 20.

^{2/} Oak, et al., 1981.

^{3/} Assume 90 percent of sand pine acres (Bechtold and Knight, 1982; Florida Division of Forestry) in natural stands.

^{4/} Assume 20 percent of sand pine acres (Bechtold and Knight, 1982; Florida Division of Forestry) in natural stands.

^{5/} Assume 85 percent of sand pine acres (Oak and Barnard, 1983) in each ownership infected.

^{6/} Assume 10 percent annual increment loss in 20-35 year old natural stands.

^{7/} Assume 20 percent annual increment loss in natural stands >35 years old.

FIDIS II GROWTH LOSS

Table III.--Volume of wood (MM cubic feet) lost to non-lethal SPRD infection according to ownership and state, 1983.

State/ Annual Increment	OWNERSHIP				Total
	National Forest	Other Public	Industrial	Other Private	
Florida					
50ft ³ /ac	.897	.539	.027	1.212	2.675
75ft ³ /ac	1.346	.808	.040	1.817	4.011
Georgia	-	-	0	0	0
S. Carolina	-	-	*	-	*
Alabama	-	*	-	*	*
Total					
50ft ³	.897	.539	.027	1.212	2.675
75ft ³	1.346	.808	.040	1.817	4.011

- = No acreage present in state/owner category.

* = Very small acreage in state/owner category.

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